

UAF Cooperative Extension Service Tools for Wood Heating

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COOPERATIVE
EXTENSION
SERVICE

UNIVERSITY OF ALASKA FAIRBANKS

Wood Heating Project Parameters

- Reduce village dependence on energy imports
- Use local forest resources for local energy
- Increase local income opportunities
- Encourage use of appropriate technology
- Focus on individual residence heating
- Address wood heating concerns related to health, safety and the environment

Home Wood Heating Components

- Legal and safe harvesting of raw logs
- Processing logs into firewood
- Drying firewood for at least one season
- Safe chimney within the house cleaned yearly
- Use of an EPA approved non-catalytic or catalytic wood stove or fireplace insert
- Each of these components is essential to reduce heating costs and assure safety

Firewood Harvesting Systems

Individual or Contract

- Requires permits to harvest
- Minimal investment in equipment
- One or two person seasonal operation
- Flexible work schedule
- May be difficult to deliver firewood to market or keep up with demand
- Not a Business Model

Firewood Enterprise

- Requires permits for commercial harvest
- Requires significant Investment in equipment
- Involves eight employees
- Requires set working and operating hours
- Business matched to markets
- Business model used

Western Alaska Firewood Enterprise Analysis by Lee Elder

- Assessed the market for home heating with firewood on the Kuskokwim River
- Evaluated a sustainable public access log source on the Kuskokwim River
- Developed an operational plan: 1) to harvest logs, 2) transport logs to a process site and market firewood, 3) manage the operation
- Conducted a detailed business and economic analysis of the proposed operation.

Kuskokwim Home Heating

- Average Bethel home is 1,000 sq. ft. and
- Annual heating burns $49,171 \text{ BTUs/ ft.}^2 = 49,171,000 \text{ BTUs/yr}$
- Total households in the Mid / Lower Kuskokwim
 - 2,971
 - 92% use oil
 - 36% use wood
 - 9% use electricity



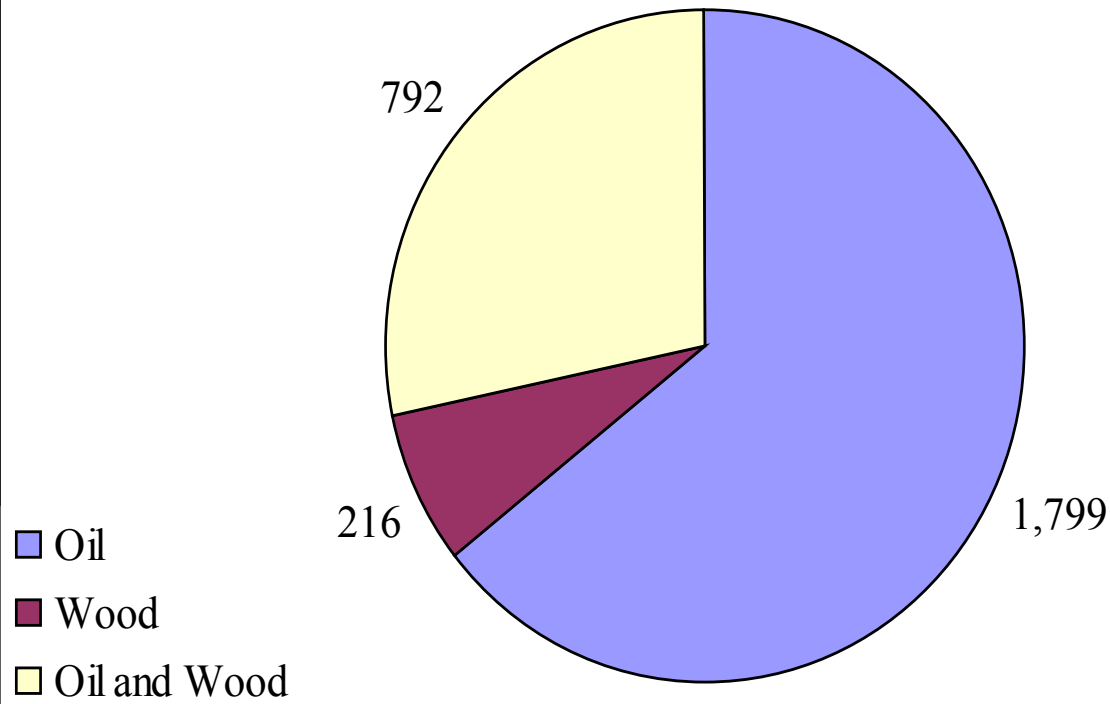
Timber Source for Firewood

- White spruce is the dominant tree species in the harvest area
- A cord of white spruce firewood equals 135 gallons of heating oil
- Market Demand in the area is 4,500 – 13,000 cords per year

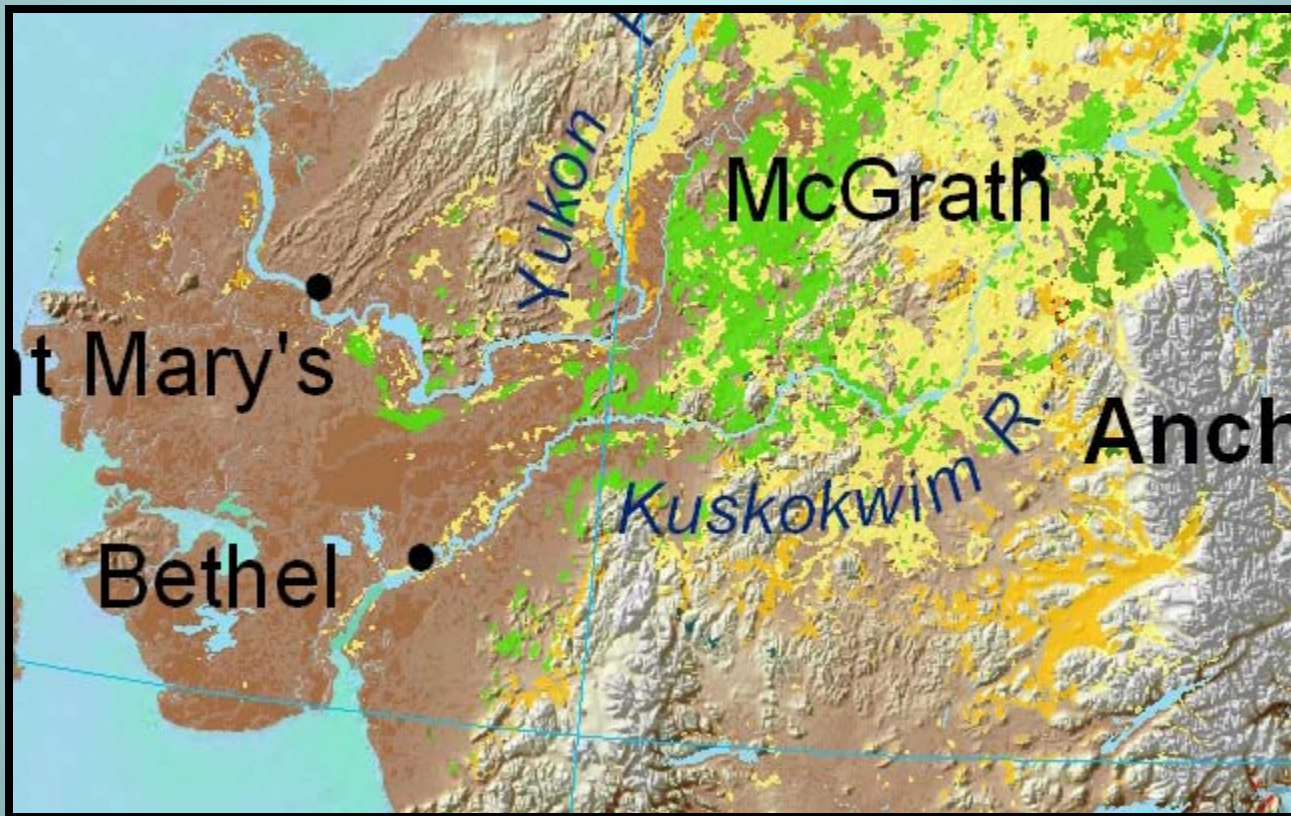


Kuskokwim Household Heating

Figure 1: Baseline Estimate for Heating Needs

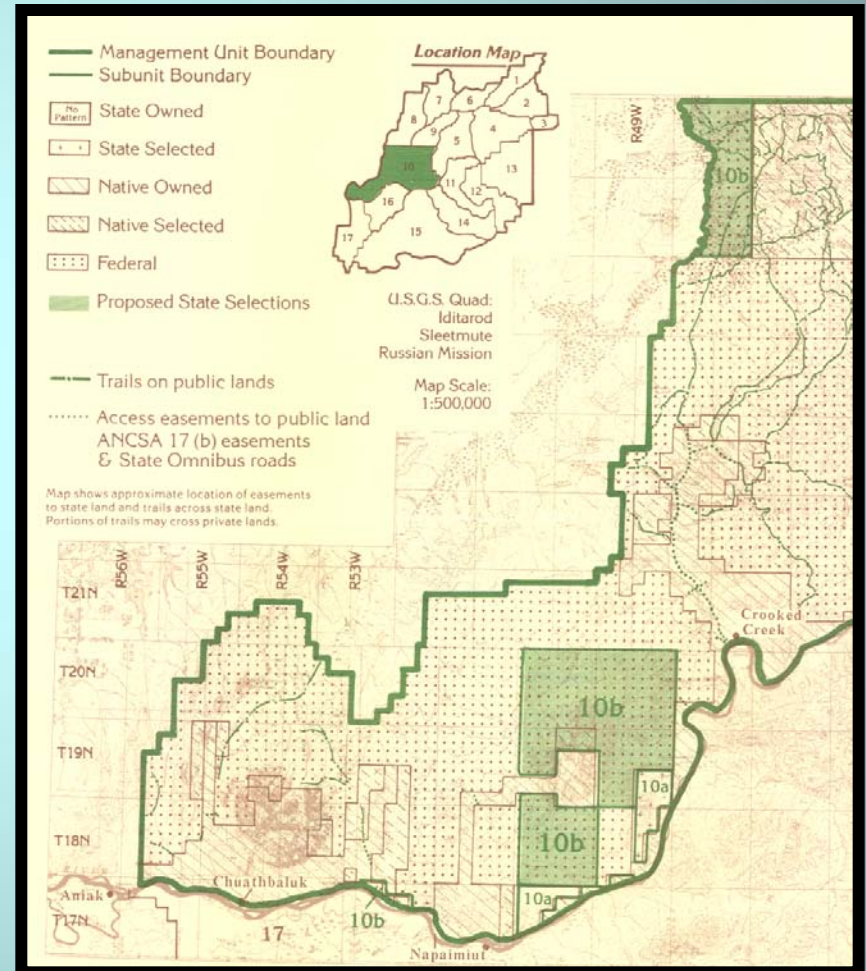


Kuskokwim Log Supply



Public Access Log Supply

- Most land along the Kuskokwim is Native Corporation owned
- Public owned land with river access provides maximum flexibility
- Public owned lands on the Kuskokwim are BLM and State of Alaska



Kuskokwim Public Owned Forests

- Lower Kuskokwim has 44 million cubic ft of harvestable timber
- 1.3 percent increase of growing stock net cubic feet volume annually (Hegg & Sieverding)
- Firewood business requires between 270,000 and 450,000 cu ft annually or between 0.06% and 1% of the available wood supply which does not exceed growth rate
- The demand for firewood does not exceed the sustainable harvest of trees (average 208 acres per year)

Firewood Enterprise

- Mobilize workers & equipment for winter harvest once river freezes (22 inches)
- Winter transport of 1/3 logs to Aniak processing and local marketing
- 2/3 logs stored for later barge transport to Bethel for processing and marketing



Harvesting Operation



+



Move to
Landing



Harvest from BLM Land



2/3 of production to Bethel



1/3 of production to Aniak

Processing & Delivery Operation



2/3 of production to Bethel



1/3 of production to Aniak



Business Model

- This business model assumes...
 - Three month long wintertime harvest
 - Ice road is used for equipment mobilization
 - All equipment can be supported by 22" ice
 - Harvest site is the first BLM land upriver from Aniak with river access
 - 3,000 cords sold in the first year of operation (1,000 in Aniak & 2,000 in Bethel)
 - Eight employees for harvesting, processing and management
 - Cord of wood retails for \$300 in the first yr and increases by \$10 per cord annually

Conclusion for Firewood Analysis

- KNA firewood business can be self-supporting and profitable
- It would reduce exporting limited local money for heating oil. Reduces Economic Leakage.
- This business is a step in the right direction...how can status quo work with heating oil at \$4 gal? or \$6?
 - Options for Rural Alaskans?
 - Find a cheaper fuel to heat with
 - Get a more efficient heating system
 - Weatherize your home
 - Quit heating your home
 - Or a combination of some or all of these



WESTERN ALASKA FIREWOOD ANALYSIS



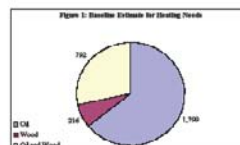
Introduction and Background

The high cost for heating oil in Bethel, much like many other areas of Alaska, creates a need for a reasonably priced substitute – firewood. To address this need, the Kuskokwim Native Association (KNA) in March 2006 requested the University of Alaska Fairbanks-Cooperative Extension Service to study the feasibility of a firewood harvesting, processing and distribution center. KNA would develop a firewood processing center in both Aniak and Bethel on an existing 12-acre farm. The resulting enterprise would boost the local economy through new jobs and services and limit the hundreds of thousands of dollars paid to Outside heating oil suppliers.

Market

First, the study identified households by heating fuel type based on the 2005 Alaska Housing Assessment for each Native corporation region (Information Insights, 2005). For instance, 92.3 percent within the for-profit Calista Corpora-

tion area heat with oil or diesel, 35.9 percent, wood, and 9.4 percent, electricity. These percentages combined with other secondary data and assumptions created estimates for the Bethel area firewood market in Figure 1.



Kuskokwim Region residents would burn approximately 4,500 to 13,000 cords of firewood annually. Further analysis, such as better estimates of wood and oil combinations or the number of newer stove designs, would narrow this margin considerably.

Firewood Analysis

Acknowledgements

- Scott Waterman, A.H.F.C.
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- UAF Extension faculty and staff Mark Dudick, Bob Wheeler, Bill Hall
- Endil Moore, Mimi Burbage, Ralph Lee, John Wynn and Bill Phelan and many others

www.alaskawoodheating.com



Wood Heating Web Site

- Assembled Extension team of Bob Gorman, Lee Elder, Heidi Veach, Karen Petersen, Adam Knight
- Developed a storyline
- Assigned tasks
- Retained a webmaster, Peter Torkelson
- Spent time and money



Wood Heat Web Site Planning

- Develop an information delivery system targeting villages in western and southeast Alaska & Copper River area
- Incorporate known limitations from state and federal regs.
- Address wood heat health and safety issues





CES RURAL DEVELOPMENT WOOD ENERGY

- [Home](#)
- [Home Heating](#)
- [Municipal Heating](#)
- [Cost Calculator](#)
- [Wood Availability](#)
- [Wood Species Btu's](#)
- [Harvesting Wood](#)
- [Handling Wood](#)
- [Working Safely](#)
- [Additional Links](#)

Is heating with wood right for you?

You have come to the right place for extensive information about home-heating systems, municipal heating systems, wood BTU values and an on-line cost calculator so you can compare various heating fuels. [Learn More >>](#)

How much does it cost to heat with wood?

Use our on-line heating cost calculator to determine which heating systems and fuel types will save you the most money. But here's a hint: wood is almost always the best value for your heating dollar. [Learn More >>](#)

What kind of wood is available in my area?

Wood availability varies significantly across Alaska. Use the location maps to determine what species flourish in your area. [Learn More >>](#)

Can I harvest wood on public land?

Probably not without a permit. Besides private owners, Federal, State and Native entities own most of the land, and their wood-cutting policies vary. Review the Harvesting Wood page to see where and how you can harvest firewood. [Learn More >>](#)

Is wood cutting dangerous?

It can be. Please review and practice appropriate safety standards while cutting and hauling wood. Chainsaws and falling trees can easily injure the unprepared. Please review the guidelines for proper wood handling and hauling. [Learn More >>](#)

- [On-line heat cost calculator](#)
Compare the costs of different fuels
- [Home Heating applications](#)
Learn how to heat your home most effectively
- [Wood availability by region](#)
Learn what species are available to you, and what they may cost



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This project supported by grant #2004.06301 from a USDA Cooperative State Research, Education and Extension Service Award.

www.alaskawoodheating.com

- Provides information on the heating value of different Alaska forest tree species
- Information on determining forest land ownership and access for firewood
- Resources for cutting, hauling and processing firewood
- Links to a variety of wood heating resources
- A fuel comparison cost calculator



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Wood Heating Cost Calculator

Where do you live?

Choose the community closest to you

How well is your home insulated?

If you are unsure and your home was built since 1985, choose medium, if before 1985 choose lower

How large is your home?

square feet

What kind of heating system would be used?

Choose the system most similar the one you are considering

What type of fuel would you use?

How much does this fuel cost?

\$ per unit.

Common prices are \$150 per cord, \$3.50 per gallon, \$.12 per kWh or \$.81 per hundred cubic foot.

[Clear my calculations](#)

Also see:

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Where do you live?

- Aniak

Choose the community closest to you

How well is your home insulated?

Medium, fairly good insulation, tight windows and well sealing doors

If you are unsure and your home was built since 1985, choose medium, if before 1985

choose lower

How large is your home?

1000 square feet

What kind of heating system would be used?

Wood, Franklin or barrel stove

Choose the system most similar the one you are considering

What type of fuel would you use?

Spruce ~ sold by the cord

How much does this fuel cost?

\$ 300 per unit.

Common prices are \$150 per cord, \$3.50 per gallon, \$.12 per kWh or \$.81 per hundred cubic foot.

Calculate Heating Cost

Clear my calculations

Also see:

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Scott Waterman, of Alaska Housing Finance Corporation, and Ginny Moore, of Flattop Technical Services, helped develop the cost calculator.

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Wood Heating Cost Calculator

[Print my calculations](#)

Generated on: 04/18/08

Calculation #1

Your Location: Aniak

Heater Type: Oil conventional furnace or boiler

System Efficiency: Approximately 60%

Your Fuel Type: Oil

Your Fuel Cost: \$4.50

Total Heating Cost: \$2,567.07

Cost Difference: \$ -1,360.41

Calculation #2

Your Location: Aniak

Heater Type: Wood, airtight door, non-catalytic

System Efficiency: Approximately 63%

Your Fuel Type: Spruce

Your Fuel Cost: \$300.00

Total Heating Cost: \$1,206.66

Cost Difference: \$ 2,594.31

Calculation #3

Your Location: Aniak

Heater Type: Wood, Franklin or barrel stove

System Efficiency: Approximately 20%

Your Fuel Type: Spruce

Your Fuel Cost: \$300.00

Total Heating Cost: \$3,800.97

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Wood Energy Content

Unless you have a free source of fuel or electricity, wood is the least expensive way to heat your home. With the rising cost of petroleum products, heating with wood makes sense.

Here's how the energy content of various fuels and wood compare. To generate a specific heating cost for your home using different fuels, [try our heating cost calculator](#) »

Fuel type:	Density:	Lbs per Cord	Energy Content
Birch ¹	41.0	3,485	23,600,000 Btu/cord
Hemlock ¹	33.6	2,856	22,000,000 Btu/cord
Black Spruce ²	29.2	2,482	15,900,000 Btu/cord
White Spruce ¹	30	2,550	18,100,000 Btu/cord
Sitka Spruce ¹	30	2,550	18,100,000 Btu/cord
Aspen ¹	28.4	2,414	16,600,000 Btu/cord
Poplar ¹	25.5	2,168	15,000,000 Btu/cord
Tamarack ²	38.2	3,247	16,000,000 Btu/ton
Cottonwood ²	24.8	2,108	14,500,000 Btu/cord
Wood Pellets			16,000,000 Btu/ton
Lignite Coal ³			17,400,000 Btu/ton
Oil ³			134,000 Btu/gal
Electricity ³			3,413 Btu/kWh
Natural Gas ³			1,000 Btu/ft ³
Propane ³			91,800 Btu/gal

1 - values taken from Purchasing Firewood in Alaska published 10/96, AK DNR/DOF/ICFP.

2 - values taken from The Encyclopedia of Alternative Energy and Sustainable Living; 16 July 2006

3 - Values taken from *Heating Values of Fuels* by Rich Seifert

Less dense wood have less material for combustion and may require two cords to produce the same heat as one cord of a heavier, denser wood. Some examples of low-heat firewoods "include willows, basswood, cottonwood, and yellow (tulip) poplar. Seasoned, they weigh only about half as much as denser species, even though their high moisture content when green may suggest they are denser than they are. They're not good for heating because they burn up quickly, but can serve well as kindling, also because they split easily."¹

The Btu values are based on dry or seasoned wood with 20% moisture. Wet or green wood has higher moisture and requires a large amount of heat to evaporate the moisture before the wood can burn and give off heat. Cutting firewood in the spring allows the wood to dry through the summer and be ready for the coming winter.

Driftwood washes up along the coast and the Yukon and Kuskokwin rivers. It can be burned in Southwest and the Interior for home heating as well as smoking fish, carving, making kayaks and heating steam baths. Use caution when cutting driftwood; it collects sand, silt and gravel while traveling downriver which will dull the chain sometimes beyond repair.²

Use care when burning ocean driftwood with its considerable amounts of salt. When burned, these salts are highly corrosive to wood stoves and





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Wood Energy Resources

Alaska Building Science Network

The Alaska Building Science Network (ABSN) is a member-supported association of individuals, businesses, and organizations dedicated to promoting energy efficiency as an essential component of durable, safe and affordable housing in Alaska. Members include builders, energy raters, material suppliers, weatherization contractors and other building industries throughout Alaska and North America. ABSN programs involve education on building and home efficiency. <http://www.absn.com>

Alaska Energy Authority

Alaska Energy Authority (AEA) projects and programs support its mission by 1) providing for the operation and maintenance of existing AEA projects with maximum utility control, 2) assisting in the development of safe, reliable, and efficient energy systems throughout Alaska, which are sustainable and environmentally sound, 3) reducing the cost of electricity for residential customers and community facilities in rural Alaska, and 4) responding quickly and effectively to electrical emergencies. <http://www.aidea.org/AEA/aea.htm>

Alaska Housing Finance Corporation

Alaska Housing Finance Corporation (AHFC) is a self-supporting public corporation with offices in 16 communities throughout the state. It's mission is to provide Alaskans access to safe, quality, affordable housing. AHFC has many programs some of which include: home financing, weatherization and energy efficiency education. <http://www.ahfc.state.ak.us/>

Bureau of Land Management

The Bureau of Land Management (BLM) manages more public land than any other Federal agency and plays a key role in implementing the Energy Policy Act of 2005. In managing this public land – 261 million surface acres and 700 million sub-surface acres of mineral estate – the BLM supervises multiple uses of the land, including energy development. <http://www.blm.gov/nhp/index.htm>

Cold Climate Housing Research Center

The Cold Climate Housing Research Center (CCHRC) is an industry based, non-profit corporation created to facilitate the development, use, and testing of energy efficient, durable, healthy and cost-effective building technologies for Alaska and the world's cold climate regions. The Research Center was conceived and developed by members of the Alaska State Home Builders Association, representing over 1,200 building industry firms and groups, the largest per capita builders' association in the nation. Ninety percent of CCHRC's charter members are general contractors from across the state. The Alaska professional building community is highly regarded as a national leader in energy efficient housing design and construction. <http://www.cchrc.org/>

Forestry, Fire and Aviation Program

The goal of the Division of Forestry Fire and Aviation Program is to provide safe, cost-effective and efficient fire protection services and related fire and aviation management activities to protect natural resources, man-made improvements and human life on state, private, and municipal lands. <http://www.dnr.state.ak.us/forestry/fire/current.htm>



Fuels for Schools

Fuels for schools fund/conduct engineering assessments, identify existing financial resources and provide technical assistance for wood-heating projects. The program also promotes and encourages the use of wood biomass as a renewable natural resource to provide clean, readily available energy source suitable for heating systems in public and private buildings, and facilitates the removal of hazardous fuels from forests by assisting in the development of viable commercial uses of removed material. <http://www.fuelsforschools.org/>

Ketchikan Wood Tech Center

The Ketchikan Wood Technology Center (KWTC) is a non-profit research and development lab in Ketchikan created in 2000 to assist and support an Alaska forest products industry facing declining log prices, the steady erosion of appearance lumber prices, and the closure of Alaska's two major pulp mills. KWTC performs a substantial amount of research on particular types of wood. http://www.alaskawoodtech.org/KWTC_intro.html

Rural Energy Enterprises

Rural Energy Enterprises (REE), a wholly owned subsidiary of RurAL CAP, is a wholesale distributor of energy-efficient and money-saving products. REE began in 1987 to provide RurAL CAP with a non-grant source of income and to offer rural residents energy-saving devices. <http://www.rural-energy.com/>

Sitka Wood Utilization Center

The center has a research and technology transfer mission, and works closely with Alaska wood-products industries and timber-dependent communities to explore new products and processes. The SWUC also offers workshops and conferences to broad audiences. The staff is also involved in market efforts to promote Alaskan woods, wood products and to transfer research results to users. <http://www.fs.fed.us/pnw/sitka/>

U.S. Forest Service/Products Laboratory

Today, field scientists and support staff research expanded and diverse aspects of wood use. Studies concentrates on pulp and paper products, housing and structural uses of wood, wood preservation, wood and fungi identification, and finishing and restoration of wood products. In addition to traditional lines of research, FPL is responding to environmental pressures on forest resources by using cutting-edge techniques to study recycling, develop environmentally friendly technology and understand ecosystem-based forest management. <http://www.fpl.fs.fed.us/>

UAF Cooperative Extension Service

The University of Alaska Fairbanks' Cooperative Extension Service (CES) mission is to interpret and extend relevant research-based knowledge in an understandable and useable form, and to encourage the application of this knowledge to solve the problems and meet the challenges that face Alaska. CES is an outreach education delivery system supported by a partnership between the United States Department of Agriculture and the University of Alaska Fairbanks and College of Rural Alaska. CES has energy and housing extension specialists as well as forestry specialists. <http://www.uaf.edu/coop-ext/publications/eehpubs.html>

Also see:

- **On-line heat cost calculator**
Compare the costs of different fuels
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Summary

- Firewood is a viable home heating option in much of Alaska
- A firewood harvesting business is viable on the middle / lower Kuskokwim River
- CES provides a variety of resources on wood energy



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- Thanks to our many project partners
- For more information on the UAF CES Rural Development Project go to www.uaf.edu/coop-ext/ruraldevelopment



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